Analysis of Nature and Determinants of Occupational Diversification of Rural Workforce in Puruliya District, West Bengal, India

Tanmoy Basu[1], Biraj Kanti Mondal

Abstract

Occupational diversification in Puruliya district, West Bengal, India, has a significant impact on rural livelihoods by involving people in multiple income-generating activities, leading to shifts from agricultural to non-agricultural pursuits. The study examines the nature and factors influencing occupational diversification in the rural workforce, utilising secondary data from the Indian Census. In 2001 and 2011, Jhalda-II and Jaypur experienced the highest diversification, while Barabazar and Manbazar-I experienced the lowest. The study found that irrigation intensity, average landholding size, and small landholding area significantly predicted Rényi entropy in 2001, while literacy rate, cropping intensity, crop diversification index, and small landholding area also significantly predicted it in 2011 (n = 20, p < 0.05, p < 0.10). From 2001 to 2011, occupational diversification in the five Community Development blocks of Puruliya district increased significantly, indicating a persistent diversification of occupations among rural workers, which emphasises the importance of employment for economic and livelihood development.

Keywords: occupation, rural workforce, diversification, entropy, marginal effect

Introduction

A country's occupational structure refers to the division of its population among various occupations and professions. The United Nations Framework Convention on Climate Change defines occupational diversification as a strategy for transforming economies by engaging a large workforce in multiple economic activities (UNFCCC, 2016, p. 7). According to Sinha (2007, p. 51), the "new economic policy" introduced in the 1990s created

employment opportunities in non-agricultural sectors in India. The diversification of the economy is a crucial factor in generating employment in developing and least-developed countries (Freire, 2017, pp. 1-2).

In this context, Chand et al. (2017, p. 67) noted that the growing trend of job creation in the non-farm sector led to a shift of the workforce away from agriculture in rural areas of India. Occupational diversification within households from agricultural to non-agricultural activities became evident in the post-1980s period in India (Bhue & Vijay, 2018).

According to the Census of India (2001), 31.7% of the population was engaged in cultivation as cultivators, and 26.7% as agricultural labourers. Additionally, 4.7% were involved in household industries, while 37.5% were classified as other workers. However, this scenario changed by 2011. The Census of India (2011) reported that 41.89% of the population was engaged as cultivators and 49.45% as agricultural labourers, with 8.21% in household industries and 27.67% as other workers.

The present study employs generalised entropy measures to analyse the disaggregation and diversity of occupations. It explores the interrelationship between selected dependent and independent variables to understand how individual determinants impact occupational diversification in the study area. The focus of this study is to analyse the nature of occupational diversification in the rural workforce and to identify the primary factors influencing this diversification from 2001 to 2011.

Review of Contemporary Research

The Census defines an individual's occupation as their role in a productive activity (Census of India, 1971). A significant social development impacting local economies, livelihoods, migration, well-being, and social organisation is the structural shift in employment within India's rural-urban continuum (Choithani et al., 2021, p. 105617). The decades following India's economic reforms in the post-1980s saw a transition in household occupations from agricultural to non-agricultural pursuits (Bhue & Vijay, 2018). Research indicates that while there have been changes in occupational diversification, these are not as prominent as the shifts in gross value added across all economic sectors, which have contributed to rising unemployment in India during the post-reform era (Padder & Mathavan, 2022, p. 392).

The role of the labour force in the The agricultural sector has been in decline, particularly among hired labourers. Consequently, many households of agricultural labourers have turned to occupational diversification as a strategy to

enhance their income (Kundu and Das, 2022). To ensure sustainable income for this group in West Bengal, India, addressing poverty through vocational diversity is a crucial first step (Kundu and Das, 2022).

Mehta (2018) reported that in 1993 and 1994, the share of GDP (gross domestic product) attributed to agriculture was 79 per cent; by 2011–2012, it had decreased to 73.2 per cent (p. 23). Moreover, India witnessed an increase in 'rural employment' in non-agricultural sectors, rising from 27 to 42 per cent between 2005 and 2015 (p. 24). Saha and Bahal (2015) identified key socio-economic and household-level drivers of this change, including 'family labour,' 'household income,' 'landholding size,' 'land cultivation,' 'livestock,' 'educational development,' 'social participation,' and 'migration' (p. 7).

Individuals with an education in rural India have a better chance of finding work in non-agricultural sectors (Kaur et al., 2019, p. 214). They are increasingly venturing into non-agricultural fields in search of more 'secure and regular' occupations (p. 214). According to Ray and Majumder (2010, p. 11), 'occupational mobility' was insufficient for Scheduled Tribes (STs) across almost all of India's states in 1993. Mandela and Niyati (2020) cited the growth of non-agricultural activities in rural areas, the advancement of education among

non-agricultural households, and the development of industrial and service sectors in urban areas as potential causes of these changes.

Chandrasekhar (1993) explained the diversification of occupations in West Bengal, noting that the increase in 'agricultural productivity' in farming activities and 'work participation in non-agricultural activities' (p. 208), along with the decreasing reliance of villages on nearby 'urban centres' (p. 207), revitalised occupational diversification. Roy et al. (2018) identified primary factors influencing livelihood diversification in the Burdwan and Purulia districts, including the respondents' age, 'dependency ratio,' educational attainment, 'land-man ratio,' and the distance from the nearest town or market (p. 41). The 'livelihood diversification index' indicated an increase in impoverishment in Purulia district and a decrease in the agriculturally advanced Burdwan district between 2017 and 2018 (p. 39).

To accelerate occupational and livelihood diversification in West Bengal, Dutta and Ghosal (2014) proposed extending the 'employment generation program' to rural regions alongside effective 'land reform measures' (p. 145). This study focuses on diversifying the main worker categories, investigating workforce diversification, the economy, and occupations in rural areas. It integrates key determinants to

comprehend how socio-economic issues affect diversification. The study initiates an assessment of the marginal effects of predictors on occupational diversification and compares essential diversity-measuring indices. Conducted regionally, this study contributes to our understanding of the evolving intra- and inter-occupational connections within the Indian societal context.

Objectives of the Study

The study aims

1. To analyse the spatio-temporal variation of occupational diversification and its socio-economic determinants in the Community Development Blocks (C.D. Blocks) of Puruliya District, West Bengal, from 2001 to 2011.

2. To identify the relationship between occupational diversification and its determinants.

3. To predict the marginal effects of the determinants of occupational diversification in the study area.

Materials and Methods

Study Area

Puruliya district is the westernmost district in West Bengal, India, and it is one of the most drought-prone areas in the country (Fig. 1). It is situated between latitudes 22°42′35″ N and 23°42′00″ N, and longitudes 85°49′25″ E and 86°54′37″ E. The district covers an area of 6,259 square kilometres and comprises twenty Community Development Blocks (Census of India, 2011). The northwest, west, and southwest regions of Puruliya are characterised by predominantly undulating terrain, which is part of the Chota Nagpur plateau region (Fig. 2).

According to the 2001 Census of India, the district had 38,400 cultivators and agricultural labourers, as well as 22,614 household industry workers. By 2011, the number of cultivators and agricultural labourers had risen to 38588, while the total number of household industry workers and other workers reached 31624 (Census of India, 2011). The local population primarily relies on the primary sector for their livelihoods, although many workers are migrating to neighbouring border districts and states.

There has been a significant shift in the district's employment structure since the post-land reform period. The proportion of cultivating and non-cultivating households in rural areas decreased from 65.61% in 2002-2003 to 52.39% in 2012-2013, with non-cultivating households constituting 47.61% of the rural demographics (Bhue, 2017, p. 619).
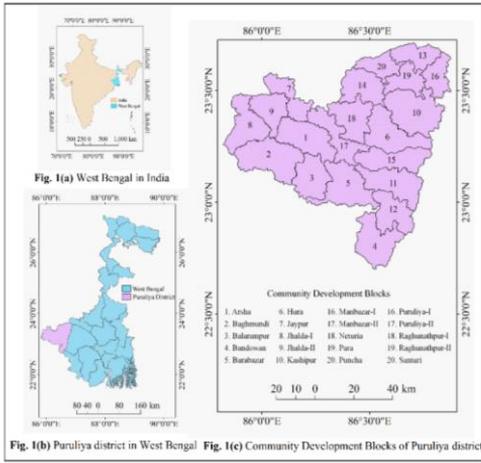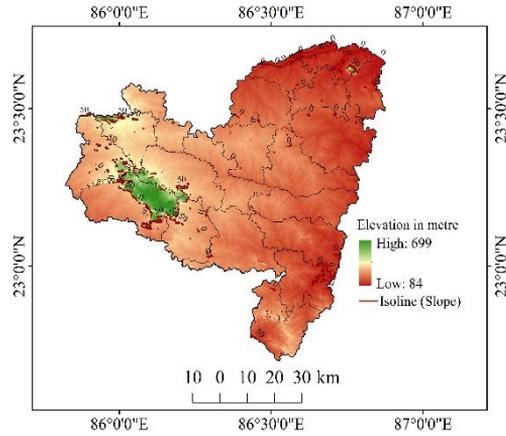
Figure 1

Location Map of the Study Area

Figure 2

Relief and Slope Condition of Puruliya District

Sources of the Data

The study has been conducted using secondary data. Different categories of work participation rates have been collected from the Census of India (2001 and 2011) to measure occupational diversification. Other relevant data have been collected from the District Statistical Handbook: Puruliya (2000–2001 combined and 2011) and the Agricultural Census of India (2000–2001 and 2010–2011).

Methods and Techniques

Rényi Entropy: Definitions and Notations

In the econometric study, economic diversification has been expressed as a proportion of employment across different sectors using Shannon's entropy (Hackbart & Anderson, 1975, p. 374). Shannon (Shannon & Weaver, 1949) defined the possible results of the distribution's uncertainty as $H(p_1, p_2,..., p_n)$ is

$$\sum_{k=1}^{n} p_k \log_2 \frac{1}{p_k} \qquad (1)$$

where probabilities $p_1, p_2, ..., p_n$ are the entropy of the distribution p, and $H(p)$ is the quantity (Rényi, 1961, p. 547). Shannon's entropy is 'generalised' to be Rényi entropy (Mayoral, 1998, p. 102) and is expressed as a 'continuous' form of 'Shannon's entropy' (Bromiley et al., 2004, p. 2). In the present study, Rényi entropy (Rényi,1961) has been used to measure the diversification of occupations in the study area. When the determination of Rényi entropy is 'alpha (∝) variable' with the 'logarithmic base' e (Masisi et al., 2008, p. 42), the equation is

$$H^r(X) = \frac{1}{1-r} \log\left(\sum_{i=1}^{M} q_i^r\right), r \neq 1, r > 0 \qquad (2)$$

where q is the proportion of item i.

$$H_\alpha = \frac{\ln(\sum P_i^\propto)}{1-\propto} \qquad (3)$$

where P is the proportion of item i. In this study, P is the percentage of

workers of the total workers, and $\propto$ is the scale parameter ≥ 0 and $\neq 1$. The widely used scale parameters in the diversity measurement by 'Shannon's Index' are 1, 'Simpson's Index' is 2, and 'Berger Parker's is ∞ (Kindt et al., 2001, p. 1). In the study, the scale parameter is 2 ($\alpha \rightarrow$ 2).

Statistical Techniques

The multiple linear regression model has been used to identify the relationship between occupational diversification and its determinants. The formula of the 'multivariate regression' model (Uyanık & Güler, 2013, p. 235) is

$$Y = \beta_0 + \beta_1 X_1 + \ldots + \beta_n X_n + e_t \qquad (4)$$

(where Y is the dependent variable (here, Rényi entropy); X_1 is the independent variable; β_1 is the parameter, and e_t is the error). The 'marginal effect' of the population mean has been calculated using the following formula in the regression model's post-estimation analysis adopted by Leeper (2017, p. 9),

Marginal Effect concerning
$$X_1 = \frac{dY}{dX_1} = \beta_1 + \beta_3 X_2 \qquad (5)$$

where d is the change; Y is the dependent variable; X is the independent variable; β_1 is the parameter.

Relevant socio-economic indicators have been selected to predict occupational diversification are:

1. Average Household Size (AHS)
2. Percentage of Scheduled Caste to Total Population (SC)
3. Percentage of Scheduled Tribes to Total Population (ST)
4. Literacy Rate (per cent) (LR)
5. Crop Productivity (Overall Yield Index) (OYI, Shafi, 1972)
6. Cropping Intensity (per cent) (CI)
7. Irrigation Intensity (per cent) (II)
8. Crop Diversification Index (CDI, Entropy Index (*EI*) (Hart, 1971)
9. Average Landholding Size (hectare) (ALS)
10. Percentage of Area under Marginal Landholdings (MLS)
11. Percentage of Area under Small Landholdings (SLS)

Results and Discussion

Occupational Categories and Spatio-Temporal Changes in Workforce Distribution

The Census of India (2011) categorises occupations into four main and four marginal worker groups. Between 2001 and 2011, the percentage of the working population in the Puruliya district decreased from 44.55% to 42.65% (Figs. 3 and 4). In 2011, the rates of main and marginal workers in the district were 20.93% and 21.71%, respectively, which were 25.43% and 19.03% in 2001.

In the C.D. blocks of Manbazar-II and Puncha, the participation rate in agriculture increased, whereas it declined in other blocks. Notably, Neturia and Raghunathpur-II

witnessed the most significant rise in the number of workers engaged in non-agricultural activities compared to Manbazar-II and Puncha.

There was a significant decline in work participation among main cultivators across several blocks, including Baghmundi, Bandowan, Barabazar, Manbazar I, and Manbazar II, between 2001 and 2011. In Barabazar, Jaypur, Puruliya-I, Puruliya-II, Puncha, Raghunathpur-I, and Santuri blocks, the proportion of main agricultural labourers fell below 5%.

Figures 3 and 4

Work Participation of the Different Categories of Workers in 2001 and 2011
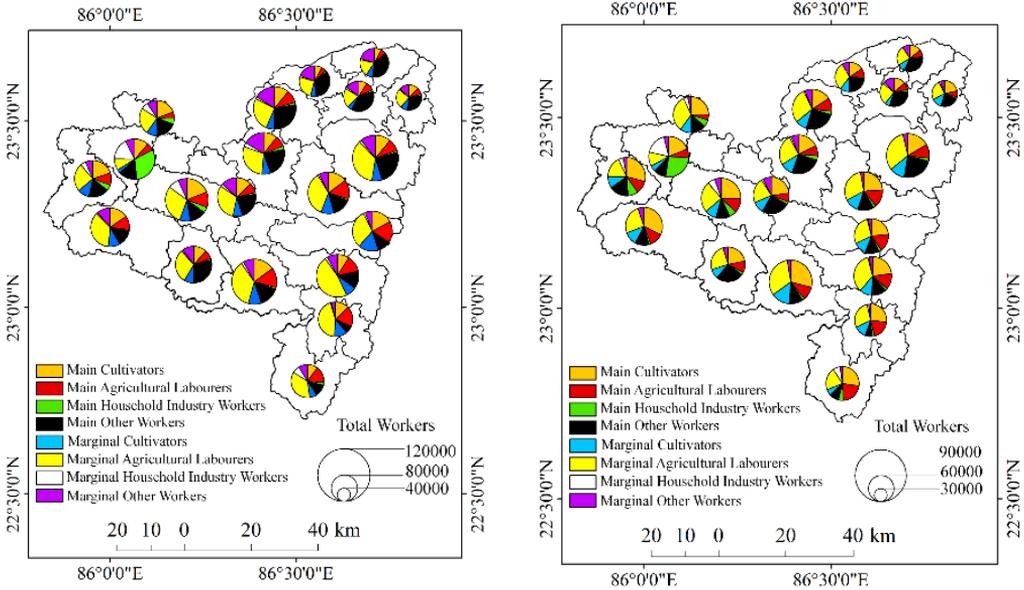
In contrast, the percentage of other main workers increased significantly in the Raghunathpur-I, Raghunathpur-II, and Santuri C.D. blocks. The rise in main household industry workers was particularly noteworthy in Jhalda-II and Neturia.

Overall, the report underscores the urgent need for the region to adopt more sustainable and inclusive work practices. While agriculture continues to employ the majority of the working population in the district, all C.D. Blocks in Puruliya have seen an increase in non-agricultural workers, except Manbazar-II and Puncha.

Nature and Spatio-Temporal Changes of Diversification (Rényi Entropy)

The study investigates how the C.D. Blocks in the Puruliya district of India are diversifying their occupations from agriculture to non-agricultural activities (see Figures 5, 6, and 7). The highest level of occupational diversification was observed in Jhalda-II in 2001, with a Rényi entropy score of 2.58. The lowest

scores were reported in Barabazar in 2001 (2.15), in Jaypur in 2011 (2.62), and in Manbazar-I in 2011 (1.87). Among the blocks, Manbazar-II experienced the smallest decrease in Rényi entropy, whereas Jaypur saw the largest increase in entropy.

Furthermore, the study indicates that a significant proportion of both primary cultivators and agricultural labourers, as well as marginal cultivators and agricultural labourers, were concentrated in Manbazar-I and Manbazar-II, demonstrating substantial occupational diversification in both 2001 and 2011. During those same years, Jhalda-I and Jhalda-II experienced a notable shift towards non-agricultural occupations, with a high percentage of primary household industry workers and marginal household industry workers. Numerous rural households in the Raghunathpur-I and II and Neturia blocks of the Puruliya district have diversified their livelihoods from agricultural activities to casual work.

Relationship Between Occupational Diversification and Its Determinants

This study examines the factors influencing occupational diversification in the Puruliya district. The Rényi entropy of occupational diversification is predicted by independent variables, which account for 78.30% (p < 0.1) of the variation in entropy in 2001 (Table 1) and 78.70% (p < 0.1) in 2011 (Table 2). Model validation is achieved using the Durbin-Watson statistic, which reveals a DW value of 2.749 in 2001 and 1.672 in 2011, indicating almost no autocorrelation at a significant level.

Figures 5 and 6

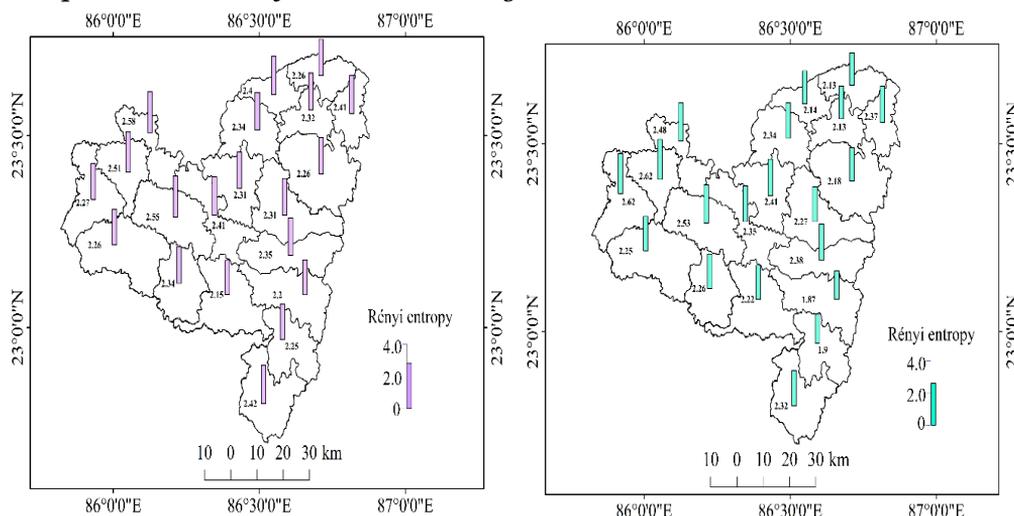*Occupational Diversification in Puruliya District in 2001 and 2011*

Figure 7

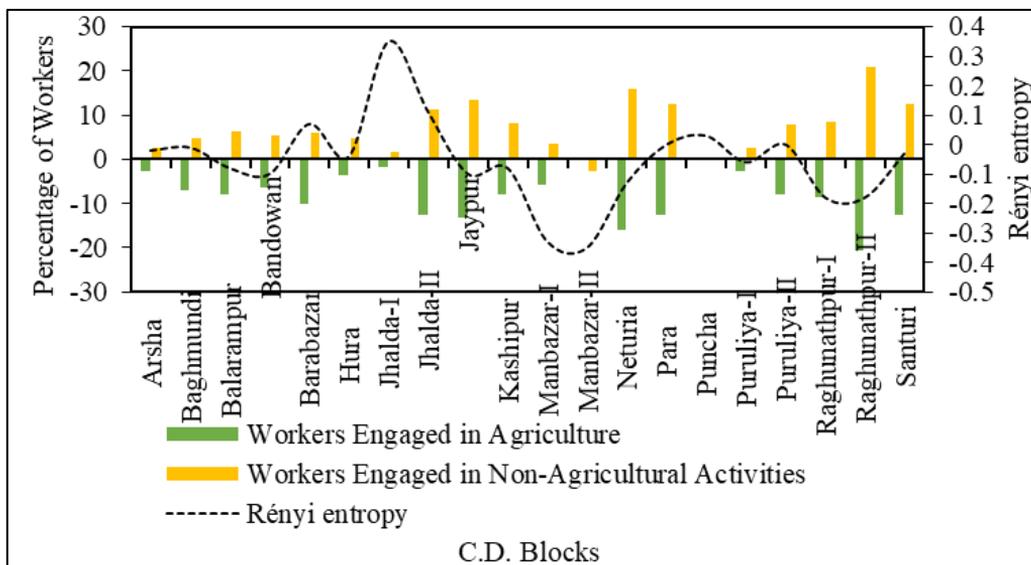*Difference (2001-2011) of Work Participation Rates and Rényi Entropy in the C.D. Blocks of Puruliya District*

Table 1

Coefficients of Multiple Linear Regression Model, and Marginal Effect Analysis (2001)

Coefficients[a]					
Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig. P>| t |
	B[b]	Std. Error	Beta		
(Constant)	4.761	1.183		4.024	0.004
AHS	0.02	0.079	0.075	0.25	0.809
SC (%)	-0.002	0.004	-0.24	-0.592	0.57
ST (%)	0.001	0.003	0.144	0.363	0.726
LR (%)	-0.004	0.003	-0.349	-1.213	0.26
OYI	0.002	0.002	0.195	0.859	0.415
CI	-0.006	0.006	-0.301	-1.045	0.327
II	0.009	0.005	0.496	1.893	0.095[*]
CDI	-0.058	0.382	-1.119	-2.073	0.569
ALH (Hectares)	-0.791	0.006	-1.043	-1.735	0.072[*]
MLS (%)	-0.011	0.004	-0.599	-3.017	0.121
SLS (%)	-0.012	0.098	-0.134	-0.594	0.017[**]
[a]Dependent Variable: Rényi entropy, R=0.885, R square=0.783, Durbin-Watson statistic (Durbin & Watson, 1971): 2.749, F=2.622 (Sig.= 0.091), RMSE=0.038; [b]Marginal Effect: Delta method (dy/dx); [*]Significant at 90 percent confidence interval, [**]Significant at 95 per cent confidence interval					

Source: Authors' calculation

Table 2

*Coefficients of Multiple Linear Regression Model and Marginal Effect Analysis (2011)*

Coefficients[a]					
Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig. P>| t |
	B[b]	Std. Error	Beta		
(Constant)	1.506	2.029		0.742	0.479
AHS	0.021	0.259	0.026	0.081	0.937
SC (%)	0.003	0.006	0.127	0.463	0.655
ST (%)	-0.005	0.005	-0.35	-1.174	0.274
LR (%)	-0.026	0.011	-0.588	-2.377	0.045**
OYI	-0.004	0.002	-0.355	-1.82	0.106
CI	0.025	0.008	0.926	3.127	0.014**
II	0.000133	0.003	-0.011	-0.046	0.964
CDI	-0.336	0.286	0.079	0.347	0.056*
ALH (Hectares)	0.099	0.043	-0.688	-1.586	0.738
MLS (%)	-0.069	0.026	0.72	1.926	0.151
SLS (%)	0.05	0.15	-0.737	-2.239	0.090*
[a]Dependent Variable: Rényi entropy, R=0.887, R square=0.787, F=2.688 (Sig.=0.085), Durbin-Watson statistic (Durbin & Watson, 1971): 1.672, RMSE 0.164; [b]Marginal Effect: Delta method (dy/dx); *Significant at 90 percent confidence interval, **Significant at 95 percent confidence interval					

Source: Authors' calculation

Figures 8 and 9

Relationship Between Rényi Entropy and Standardised Predicted Values in 2001 and 2011
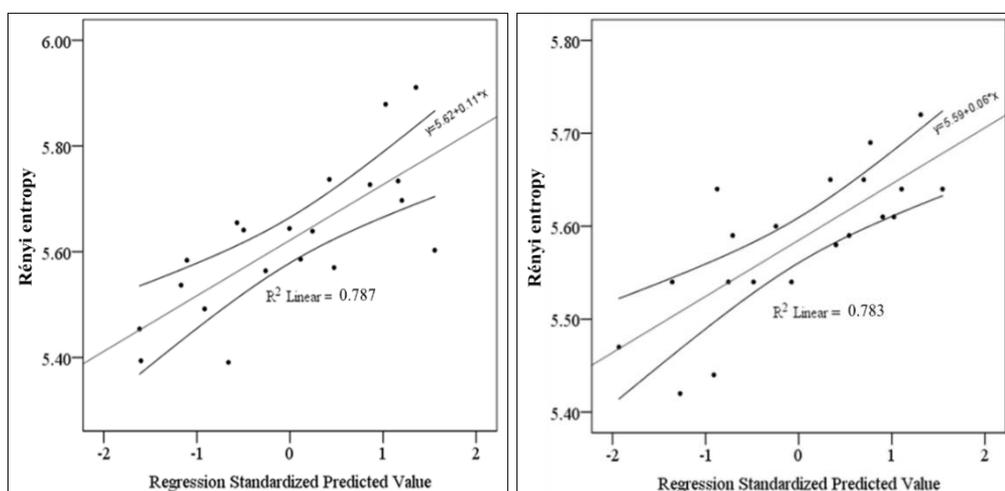
In 2001, the Rényi entropy increased by 2% as the average household size grew; however, it declined by 0.2% with a 1% rise in the Scheduled Caste (SC) population, while it increased by 0.1% with a 1% increase in the Scheduled Tribe (ST) population. A 1% rise in literacy led

to a 0.4% decrease in Rényi entropy. Additionally, the overall yield index and irrigation intensity raised Rényi entropy by 0.2% and 0.9%, whereas cropping intensity and the crop diversification index decreased it by 0.6% and 5.8%, respectively. An increase of one hectare in area under marginal and small landholdings reduced Rényi entropy by 1.1% and 1.2%, respectively,

while an increase of one hectare in the average landholding size resulted in a dramatic decrease of 79.1% in Rényi entropy. Notably, average landholding size was the strongest predictor of occupational diversification in 2001.

In that year, the highest prediction for occupational diversification was observed in Kashipur (1.357), while the lowest was in Arsha (-1.637). By 2011, Rényi entropy increased by 2.1% with a unit increase in average household size. Similarly, Rényi entropy rose by 0.3% with a 1% increase in the SC population but decreased by 0.5% with a 1% increase in the ST population. The literacy rate also reduced Rényi entropy by 2.6% in 2011. The overall yield index had a negative impact, lowering Rényi entropy by 0.4%. Conversely, the crop diversification index significantly reduced Rényi entropy by 36.6%, while cropping intensity and irrigation intensity increased it by 2.5% and 0.0133%, respectively. In 2011, the most influential factor affecting occupational diversification was the crop diversification index.

Moreover, in 2011, a 1-hectare increase in average landholding size raised Rényi entropy by 5.9%, while a 1% increase in area under marginal landholdings decreased it by 6.9%. An increase of 1% in area under small landholdings raised it by 5.9%. The highest prediction for occupational diversification in 2011 was in Bandowan (1.406), and the lowest was again in Arsha (-1.740). The regression models were validated using RMSE analysis, yielding RMSE values of 0.038 in 2001 and 0.164 in 2011, which indicates reasonable predictive performance, as both values are below 0.5. Figs. 8 & 9 and Figs. Figs. 10 and 11, respectively, show the relationship between Rényi Entropy and Standardised Predicted Values in 2001 and 2011, as well as Average Marginal Effect Plots in 2001 and 2011.
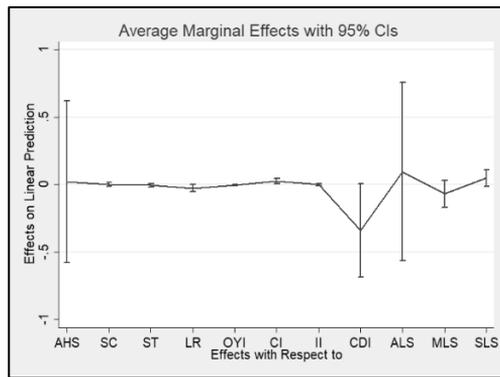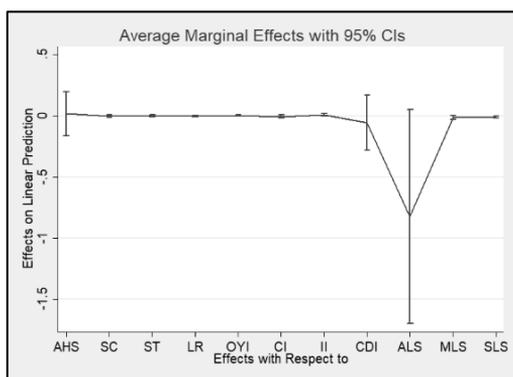
In the Puruliya district, most Community Development (C.D.) blocks experienced a decline in occupational diversification by 2011, despite a lack of significant improvement in this area, which was linked to increases in average household size in both 2001 and 2011. The percentage of the ST population had a positive effect on the rate of occupational diversification, while the percentage of the SC population had a negative effect. Rising literacy rates in the Puruliya district hindered the diversification of occupations among non-farming workers. While agricultural output positively influenced occupational diversification in 2001, it had a

negative impact in 2011, contradicting higher expectations for that year. Furthermore, cropping intensity had an adverse effect on diversification in 2011, despite higher projections. Meanwhile, the crop diversification index promoted agricultural diversification but hindered the transition from agricultural to non-agricultural activities in both 2001 and 2011. The study underscores the considerable impact of average landholding size on occupational diversification in the Puruliya district. Small landholders often engage in non-agricultural activities, whereas marginal landholders primarily work as agricultural labourers.

Figures 10 and 11

Average Marginal Effect Plots in 2001 and 2011

Conclusion

The study examines twenty Community Development blocks in Puruliya district to investigate the movement of workers between agricultural and non-agricultural sectors. Between 2001 and 2011, a clear trend of occupational diversification emerged among agricultural workers, with a decrease in the number of people working in agricultural operations. A significant shift in occupational diversification has occurred with the transition from agricultural to non-agricultural pursuits. Crop diversification, the amount of land under marginal landholding, literacy rate, irrigation intensity, and average family size all negatively influenced occupational diversification. Cultivators and agricultural workers increased because of agricultural activities such as increasing crop output, irrigation intensity, and average landholding size. However, literacy rates hindered the ability of non-agricultural workers to diversify their livelihoods, as they did not provide them with the necessary assistance to improve their skills. Trends in crop diversification reduced the need for farmers to change their occupations. The district could generate resources and a variety of jobs despite natural

limitations. Resolving these issues may help remove barriers to the rural economy and improve the standard of living for residents of the Puruliya district.

Acknowledgement

References

Bhue, C. (2017). Occupational diversification in the rural sector: A state-level analysis for India: Some observations. In *9th ASAE International Conference: Transformation in Agricultural and Food Economy in Asia*, 11-13 January 2017, Bangkok, Thailand. Proceedings (pp. 612–620). Department of Agricultural and Resource Economics, Faculty of Economics, Kasetsart University.

Bhue, C., & Vijay, R. (2018). Occupational diversification in the rural sector between 2003 and 2013: Some observations. *The Indian Journal of Labour Economics, 60*(4), 663–670. https://doi.org/10.1007/s41027-018-0116-5

Bromiley, P. A., Thacker, N. A., & Bouhova-Thacker, E. (2004). Shannon entropy, Renyi entropy, and information. *Statistics and Information Series, 004*, 1-8. http://www.tina-vision.net/docs/memos/2004-004.pdf

Census of India. (1971). *General economic tables. Series 1, Part II-B (ii)*. Registrar General & Census Commissioner, India. https://censusindia.gov.in/nada/index.php/catalog/30488

Census of India. (2001). *District Census Handbook Puruliya, Village and Town Wise Primary Census Abstract (PCA)*. Directorate of Census Operations, West Bengal, Series-20, Part-A and B, 1-1255. http://censusindia.gov.in/2011census/dchb/1914_PART_B_DCHB_PURULIYA.pdf

Census of India. (2011). *District Census Handbook Puruliya, Village and Town Wise Primary Census Abstract (PCA)*. Directorate of Census Operations, West Bengal, Series-20, Part XII-B, 1-464. https://censusindia.gov.in/pca/

Chand, R., Srivastava, S. K., & Singh, J. (2017). Changes in rural economy of India, 1971 to 2012. *Economic and Political Weekly, 52*(52), 65. https://www.epw.in/journal/2017/52/review-rural-affairs/changes-rural-economy-india-1971-2012.html

Chandrasekhar, C. P. (1993). Agrarian change and occupational diversification: Non-agricultural employment and rural development in West Bengal. *The Journal of Peasant Studies, 20*(2), 205-270. https://doi.org/10.1080/03066159308438507

Choithani, C., van Duijne, R. J., & Nijman, J. (2021). Changing livelihoods at India's rural–urban transition. *World Development, 146*, 105617. https://doi.org/10.1016/j.worlddev.2021.105617

Durbin, J., & Watson, G. S. (1971). Testing for serial correlation in least squares regression. III. *Biometrika, 58*(1), 1-19. https://doi.org/10.2307/2334313

Dutta, R., & Ghosal, R. K. (2014). Diversification in the rural employment structure in West Bengal during the post-reform

period. *Business Studies, 35*, 136-146. https://www.caluniv.ac.in/dj/BS-Journal/vol-35-36/ix.%20Diversification.pdf

Freire, C. (2017). *Economic diversification: Explaining the pattern of diversification in the global economy and its implications for fostering diversification in poorer countries.* Department of Economic and Social Affairs, United Nations. https://www.un.org/en/desa/economic-diversification-explaining-pattern-diversification-global-economy-and

Hackbart, M. M., & Anderson, D. A. (1975). On measuring economic diversification. *Land Economics, 51*(4), 374-378. https://doi.org/10.2307/3144954

Hart, P. E. (1971). Entropy and other measures of concentration. *Journal of the Royal Statistical Society: Series A (General), 134*(1), 73–85. https://doi.org/10.2307/2343975

Kaur, A., Arora, A., & Singh, S. P. (2019). Employment diversification in rural India: Nature, pattern and determinants. *Ager: Revista de Estudios sobre Despoblación y Desarrollo Rural (Journal of Depopulation and Rural Development Studies), 27*, 189-226. https://doi.org/10.4422/ager.2019.02

Kindt, R., Degrande, A., Turyomurugyendo, L., Mbosso, C., Van Damme, P., & Simons, A. J. (2001). Comparing species richness and evenness contributions to on-farm tree diversity for data sets with varying sample sizes from Kenya, Uganda, Cameroon, and Nigeria with randomised diversity profiles. In *IUFRO Conference on Forest Biometry, Modelling and Information Science* (pp. 26–29). https://www.researchgate.net/publication/258996270

Kundu, A., & Das, S. (2022). Occupational diversification as livelihood strategy among the agricultural labour households of West Bengal, India. *Management and Labour Studies, 47*(1), 40–58. https://doi.org/10.1177/0258042X211065420

Leeper, T. J. (2017). Interpreting regression results using average marginal effects with R's margins. *The Comprehensive R Archive Network, Reference Manual.* https://cloud.r-project.org/web/packages/margins/vignettes/TechnicalDetails.pdf

Mandela, S. N., & Niyati, S. (2020). Structural transformation and the new rurality in Tamil Nadu. *IASSI Quarterly, 39*(3), 361-381.

Masisi, L., Nelwamondo, V., & Marwala, T. (2008, November). The use of entropy to measure structural diversity. In *2008 IEEE International Conference on Computational Cybernetics* (pp. 41–45). IEEE. https://doi.org/10.1109/ICCCYB.2008.4721376

Mayoral, M. M. (1998). Renyi's entropy as an index of diversity in simple-stage cluster sampling. *Information Sciences, 105*(1-4), 101–114. https://doi.org/10.1016/S0020-0255(97)10025-1

Mehta, N. (2018). Occupational diversification and rural transformation. In N. Mehta (Ed.), *Rural transformation in the post-liberalization period in Gujarat* (1st ed., pp. 23–71). Singapore: Palgrave Macmillan. https://doi.org/10.1007/978-981-10-8962-6_2

Padder, A. H., & Mathavan, B. (2022). Economic scrutiny of structural change and occupational diversification in India–A look at post-reform period. *European*

Online Journal of Natural and Social Sciences, 11(2), 387-405.

Ray, J., & Majumder, R. (2010). Educational and occupational mobility across generations in India: Social and regional dimensions. *Munich Personal RePEc Archive (MPRA)*, 28539. https://mpra.ub.uni-muenchen.de/28539/

Rényi, A. (1961). On measures of entropy and information. In *Proceedings of the Fourth Berkeley Symposium on Mathematical Statistics and Probability, 1: Contributions to the Theory of Statistics* (pp. 547–561). University of California Press. https://static.renyi.hu/renyi_cikkek/1961_on_measures_of_entropy_and_information.pdf

Roy, B. C., Khatun, D., & Roy, A. (2018). Rural livelihood diversification in West Bengal. *Agro-Economic Research Centre (For the States of West Bengal, Sikkim and Andaman and Nicobar Islands)*, Visva-Bharati, Santiniketan, West Bengal. http://www.visvabharati.ac.in/file/Final-Report-189.pdf

Saha, B., & Bahal, R. (2015). Factors leading to success in diversified occupation: A livelihood analysis in India. *The Journal of Agricultural Education and Extension, 21*(3), 249-266. https://doi.org/10.1080/1389224X.2014.927372

Shafi, M. (1972). Measurement of agricultural productivity of the great Indian plains. *The Geographer, 19*(1), 4–13.

Shannon, C. E., & Weaver, W. (1949). *The mathematical theory of communication*. Urbana: University of Illinois Press. https://pure.mpg.de/rest/items/item_2383164/component/file_2383163/content

Sinha, A. (2007). Farm sector, non-farm employment and rural livelihood: A study. *Social Change, 37*(1), 50–76. https://doi.org/10.1177/004908570703700104

United Nations Framework Convention on Climate Change (UNFCCC). (2016). *The concept of economic diversification in the context of response measures*. Technical paper by the secretariat. https://unfccc.int/documents/9179

Uyanık, G. K., & Güler, N. (2013). A study on multiple linear regression analysis. *Procedia-Social and Behavioral Sciences, 106*, 234-240. https://doi.org/10.1016/j.sbspro.2013.12.027

Authors

Tanmoy Basu

Faculty (SACT-I), Department of Geography

Katwa College, Katwa, Purba Bardhaman-713130, West Bengal, India.

Email: tanmoybasu.2017@gmail.com

Biraj Kanti Mondal

Assistant Professor, Department of Geography

Netaji Subhas Open University,

Kolkata-700064, India.

Email: birajmondal.kolkata@gmail.com